

# **EPA's Ocean Survey Vessel *Bold***

**2009 Annual Report  
Monitoring and Assessing the Health  
of Our Oceans and Coastal Waters**



## **Acknowledgements**

The Environmental Protection Agency's Oceans and Coastal Protection Division would like to acknowledge Suzanne Schwartz for her years of dedicated support in maintaining EPA's ability to monitor our oceans, coasts, and watersheds. Particularly, OCPD would like to acknowledge Suzanne's efforts in acquiring and maintaining the Ocean Survey Vessel *Bold*. Bon Voyage!

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**Cover Photo: The OSV *Bold* docked in Savannah, GA.**

Photo by: Chris McArthur, U.S. EPA

# Executive Summary



**The OSV *Bold* docked in Baltimore, Maryland.**

Photo by Eric Vance, U.S. EPA

The mission of the U.S. Environmental Protection Agency's (EPA's) Ocean Survey Vessel *Bold* (OSV *Bold*) is to monitor and assess the health of our oceans and coastal waters. The information gathered by the OSV *Bold* supports EPA-regulated activities and allows EPA to more effectively control pollution sources, whether from land or the ocean. Acting as a floating laboratory, the OSV *Bold* is helping to chart a healthier course for our oceans.

# Executive Summary

This is the fourth OSV *Bold* Annual Report. It highlights the ship's 2009 scientific survey accomplishments, capabilities, and the unique role that this vessel plays in supporting EPA's monitoring and assessment programs. In 2009, the OSV *Bold* supported scientific surveys in a variety of geographic areas, including the Atlantic Coast, the Gulf of Mexico, the Florida Keys, and the Caribbean Sea. The survey missions included monitoring ocean dredged material disposal sites, coastal eutrophication and toxicity assessments, monitoring ocean outfalls, and assessments of critical coral reef habitats. During this period, the OSV *Bold* completed 28 oceanographic surveys, involving hundreds of sampling locations, while spending 238 days at sea.

## 2009 Survey Highlights:

- Conducted monitoring for nine ocean dredged material disposal sites.
- Assessed coastal eutrophication and toxicity in the Mid-Atlantic Bight, New York Bight, and New England.
- Assessed the impact of an invasive coral species within the Florida Keys National Marine Sanctuary.
- Monitored two ocean discharge outfalls in the Mid-Atlantic Bight and in New England.
- Surveyed coral reef environments in the Caribbean Sea and Florida waters.

- Supported Federal, State, Territorial, and academic partners.

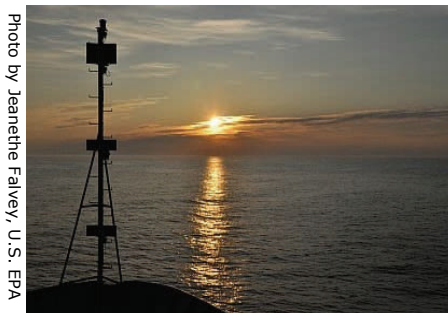


Photo by Jeanette Falvey, U.S. EPA

**Sunset off the bow of the OSV *Bold* in the Bay of Fundy.**

In 2009, various survey partners contributed to the OSV *Bold*'s successful operation, including: U.S. Army Corps of Engineers; U.S. Geological Survey; National Oceanic and Atmospheric Administration; U.S. Navy; Florida Department of Environmental Protection; U.S. Virgin Islands Department of Planning and Natural Resources; Puerto Rico Department of Natural and Environmental Resources; University of Puerto Rico; Connecticut Department of Environmental Protection; New York City Department of Environmental Protection; and, the University of Rhode Island.

In addition to supporting a large variety of scientific surveys, the OSV *Bold* hosted nine public education events in 2009. During these events, EPA scientists and OSV *Bold* crewmembers gave tours and conducted presentations for thousands of visitors. The OSV *Bold* hosted these events in Georgia, New York, Connecticut, Rhode Island, Maryland, Pennsylvania, Puerto Rico, and the U.S. Virgin Islands.

# Introduction

The oceans and coasts surrounding us are unique resources that support a large diversity of life. We rely on these complex ecosystems to provide us with places to live, play, relax, and work. Our national economy is linked in several ways to the productivity of our oceans and coasts. For instance, in 2007, the coastal economy contributed more than \$13.7 trillion to American prosperity, and supported more than 135 million jobs, according to market data from the National Ocean Economics Program. Of no less value are the marine resources that are difficult to measure economically, such as the beauty of our oceans and coasts, their cultural significance, and the vital ecosystem functions they provide.

Exposure to toxic chemical and pathogenic contamination negatively affects the entire food web. If improperly managed, ocean and coastal resources can be damaged by habitat modification, dredging, construction, and other human activities.

**Harbor seal swimming at the mouth of the Kennebec River in Maine.**



Photo by Jeanette Falvey, U.S. EPA

Photo by Charles Lobue, U.S. EPA



**School of Caesar grunts (*Haemulon car-bonarium*) in U.S. Virgin Islands coral habitat.**

Human actions can adversely affect our oceans and coastal waters. Polluted sediments from industrial and agricultural activities and operations can significantly alter aquatic ecosystems. Wastewater improperly discharged from shore or from vessels can be a threat to public health and to marine life.

The future health of our ocean and coastal resources depends on our actions today. To restore and protect these resources, EPA undertakes many efforts to identify and control problems threatening the health of our oceans and coastal waters. Collecting information and analyzing data to support management decisions are essential parts of marine resource protection. The OSV *Bold* supports EPA-regulated activities by surveying oceans and coasts to: monitor and sustain the health of our coastal waters and shores; protect human health; support economic and recreational activities; and influence actions that safeguard healthy habitats for fish, plants, and wildlife.

# The Ocean Survey Vessel *Bold*

The OSV *Bold* was constructed by the Tacoma Boat Building Company of Tacoma, Washington, and was first commissioned on October 16, 1989, as the United States Naval Ship (USNS) *Vigorous*, a Tactical Auxiliary General Ocean Survey class vessel. The vessel was later renamed the USNS *Bold* and served on many surveillance missions in the Pacific Ocean for the U.S. Navy. The Navy decommissioned the USNS *Bold* in 2004. EPA acquired the ex-USNS *Bold* on March 31, 2004, to replace the *Peter W. Anderson*, EPA's previous ocean survey vessel. EPA began scientific surveys with the OSV *Bold* on August 8, 2005.

The OSV *Bold* underwent dramatic changes in her conversion from a military surveillance vessel to an ocean and coastal water monitoring vessel. EPA improved the deck machinery and added wet and dry laboratories, including a data acquisition laboratory where information is transmitted from the sampling equipment to computers. Sampling equipment includes a side scan sonar that provides digital acoustic images of the ocean floor and a Conductivity, Temperature, Depth (CTD) water profiler that measures physical water characteristics throughout the water column in real-time. For a detailed list of scientific facilities and technical equipment on the

## OSV *Bold* Quick Facts

**Overall Length: 224 feet**  
**Width: 43 feet**  
**Draft: 15 feet**  
**Water Displacement: 2300 tons**  
**Operating Speed: 11 knots**  
**Ship Operating Crew: 19**  
**Scientific Berths: 20**



Photo by Charles Lobue, U.S. EPA

The OSV *Bold* docked in St. Thomas, U.S. Virgin Islands.

OSV *Bold*, see Appendix 1.

The OSV *Bold* is managed by EPA's Oceans and Coastal Protection Division, in the Office of Water. The EPA Vessel Manager, Kennard Potts, provides direction to Seaward Services, Inc. Seaward Services provides the sea-going crew; handles the operation and maintenance of the vessel; provides logistic support and contract management; and provides engineers, when needed, specializing in marine, mechanical, electrical, electronic, acoustical, or ocean engineering.

The OSV *Bold* provides EPA and its partners a platform to gather the scientific data needed to assess the marine environment and to make informed decisions to protect these resources and human health. In 2009, the OSV *Bold* supported surveys along the Atlantic Coast, in the Gulf of Mexico, in the Florida Keys, and in the Caribbean Sea. EPA's partners in 2009 included the U.S. Army Corps of Engineers; U.S. Geological Survey; National Oceanic and Atmospheric Administration; U.S. Navy; Florida Department of Environmental Protection; U.S. Virgin Islands Department of Planning and Natural Resources; Puerto Rico Department of Natural and Environmental Resources; University of Puerto Rico; and the Connecticut Department of Environmental Protection.

Scientific surveys conducted onboard the OSV *Bold* address requirements of Federal statutes such as the Clean Water Act, the Marine Protection, Research, and Sanc-



**The OSV *Bold* Ship's Crew.**

tuaries Act, and the Caribbean Basin Economic Recovery Act. The surveys provide scientific information and data to support EPA's mission to protect and enhance ocean and coastal waters through a variety of programs, including partnerships and regulatory actions, as well as response to emergencies. Surveys are conducted by scientists from various EPA offices, including Regional offices, the Office of Water, and the Office of Research and Development; states and territories; academic institutions; and other partners. All surveys are conducted under the leadership of EPA-certified Chief Scientists, who must complete a rigorous certification program before serving in that capacity.

# Green Activities Onboard the OSV *Bold*

The OSV *Bold* supports EPA's mission to protect ocean and coastal environments. Staff and crew are dedicated to operating the vessel in the most environmentally sustainable way possible. Best management practices coupled with the latest technologies ensure that the vessel is not degrading the resources that we seek to protect. New technologies and best management practices are utilized to reduce the impact of sewage, oil, and hull coatings that are part of the normal operation of the vessel.

The OSV *Bold* is in compliance with all domestic and international requirements for discharges resulting from normal operations, including the 2008 Vessel General Permit (VGP), issued under EPA's National Pollutant Discharge Elimination System (NPDES). The VGP regulates discharges incidental to the normal operation of vessels operating as a means of transportation. The VGP includes general effluent limits applicable to all discharges; general effluent limits applicable to 26 specific discharge streams; narrative water-quality based effluent limits; inspection, monitoring, recordkeeping, and reporting requirements; and additional requirements applicable to certain vessel types. EPA is dedicated to maintaining compliance with all discharges under the scope of the permit, and will work with individual states to ensure that the OSV *Bold* meets requirements established for State waters.

## **No Discharge Practices**

The discharge of untreated or partially-treated human waste from vessels can contribute to high bacteria counts and subsequent increased human health risks. These problems can be particularly harmful in lakes, slow-moving rivers, marinas, and other bodies of water with low flushing rates. Blackwater (sewage) and graywater (wastewater from showers, sinks, laundries, and kitchens) are kept in holding tanks on the OSV *Bold*. The waste in the holding tanks is usually pumped to an on-shore facility at the end of a mission. If a holding tank fills on a voyage, a marine sanitation device treats and disinfects the waste. After treatment, waste (containing blackwater and graywater) is disposed of only beyond three nautical miles from the shoreline.

In addition, all shipboard-generated garbage, cooking oils, and greases are collected and disposed of at onshore facilities. Any liquid collected in the bilge (compartment holding water at the bottom of a ship) is disposed of onshore in special reception facilities. Strict rules apply to disposal of all chemicals used in ship laboratories.

## **Lower Sulfur Dioxide Emissions**

Sulfur dioxide is an air pollutant that ships generate from burning fuel and that can travel over long distances. It contrib-

utes to respiratory illness and to the formation of acid precipitation. Whenever available, the OSV *Bold* uses an ultra low-sulfur fuel that significantly reduces harmful air emissions.

### **Better Hull Coating**

Hull coatings prevent corrosion and biological growth. These coatings reduce drag and increase fuel efficiency of a vessel. The hull coating on the OSV *Bold* does not contain organotin (toxic chemical painted on ship's hull) pesticides, and is certified as compliant with the International Maritime Organization's International Convention on the Control of Harmful Anti-fouling Systems on Ships. Information collected by EPA and the Department of Defense (DoD) indicates that the hull coating used on the OSV *Bold* has the lowest copper leach rate of hull coatings approved for use on DoD vessels. A lower leach rate means a lower impact to surrounding waters.

### **Non-toxic Fire-Fighting Foam**

EPA uses fire-fighting foam that can handle any fires on the ship; the foam is also environmentally safe. This protein-based foam ensures efficient fire control.

### **Ballast Water Management**

Ballast water tanks temporarily hold water to provide draft (immersion depth of a vessel) and stability. Ballast water transported and discharged by vessels may carry organisms from one waterbody to another. This is a main pathway for intro-

ducing and spreading aquatic invasive species (non-native species that can cause harm to human health, the environment, or the economy). As standard operating procedure, any exchange of ballast water (emptying and refilling ballast tanks) is recorded and done by the OSV *Bold* at sea, to limit potential transfer of invasive species between different waterbodies.

### **Best Management Practices**

Best management practices are employed in daily operations of the OSV *Bold*. Oil is carefully collected, and fueling of engines on rigid-hull inflatable boats is done with the utmost care to avoid spills. Special absorbent products and materials are used to collect drips of oil, grease, or fuel.

In addition, EPA supports shipyards that employ creativity and innovation to make their operations more environmentally sustainable.

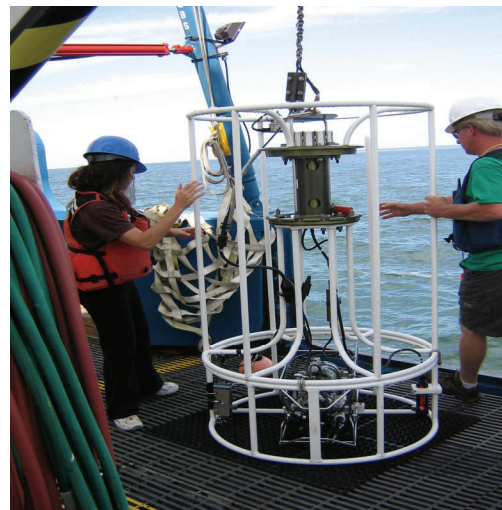
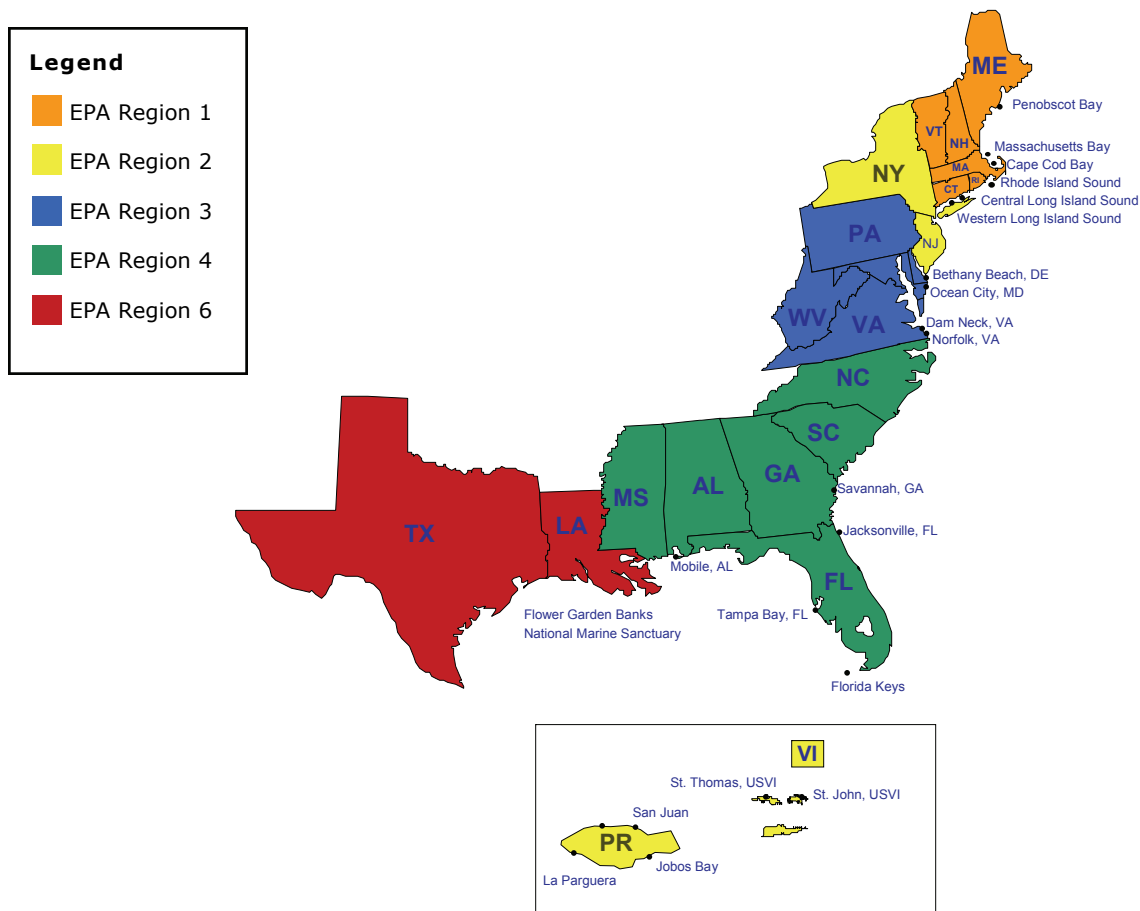


Photo by Mark Habel, U.S. Army Corps of Engineers

**EPA scientists deploy a water profile instrument to measure physical characteristics of water within the Long Island Sound.**

# 2009 Scientific Survey Highlights

**Figure 1: Scope of OSV *Bold* Monitoring and Assessments in 2009.**



In 2009 the OSV *Bold* conducted scientific surveys in the Atlantic Ocean, the Gulf of Mexico, the Caribbean Sea, and the Florida Keys (see Figure 1). While spending 238 days at sea, the OSV *Bold* completed a total of 28 oceanographic surveys, involving hundreds of sampling locations. In addition, the OSV *Bold* held educational events in Georgia, Maryland, Pennsylvania, Rhode Island, Connecticut, New York, U.S. Virgin Islands, and Puerto Rico.

## Assessment and Monitoring of Ocean Dredged Material Disposal Sites

The nation's ports, harbors, and navigable waterways are vital to the U.S. economy and national security. Dredging (the removal of sediments to maintain access to those important areas) has become increasingly significant as ships increase in size. Dredged material disposal must be conducted in a safe and environmentally acceptable manner under requirements of the Marine Protection, Research, and Sanctuaries Act (MPRSA), and the Clean Water Act. Under the MPRSA, EPA is responsible for designating ocean dredged material disposal sites, and for evaluating and concurring on dredged material ocean disposal permits issued by the U.S. Army Corps of Engineers. Additionally, the MPRSA re-

quires that a site monitoring and management plan be prepared for each site before it may be used for dredged material disposal. A crucial part of site monitoring and management plans is the characterization of baseline conditions prior to any disposal activity being conducted at the site, so that changes in benthic (bottom of water) habitat resulting from disposal activities can be identified during future surveys.

One of the primary missions of the OSV *Bold* is to perform the required periodic monitoring of existing designated ocean disposal sites, and to collect environmental data that can be used to designate new disposal sites. EPA scientists used the OSV *Bold* to assess and monitor conditions at several ocean dredged material disposal sites (ODMDS). Under the MPRSA, ODMDS trend assessment surveys are required to



Photo by Leah O'Neil, U.S. EPA

The OSV *Bold* docked in the Port of Davisville in North Kingston, Rhode Island.

assess the extent and trends of environmental impacts of dredged material disposal. Along the coasts of Jacksonville, Florida, and Dam Neck, Virginia, EPA scientists used the OSV *Bold* to perform ODMDS trend assessments. EPA scientists collected samples of bottom sediment from various locations in and around the Jacksonville and Dam Neck sites to determine chemical and physical sediment characteristics. The scientists also collected biological specimens to detect any changes in species composition, presence, and abundance. The results of these surveys will be used to evaluate whether dredged material placed at the site has caused adverse impacts, as compared to areas left undisturbed.

EPA scientists used the OSV *Bold* to confirm that dredged material is disposed properly at ocean disposal sites, that the dumping does not unreasonably degrade or endanger human health or the marine environment, and that the sites are functioning as expected. Conditions at disposal sites located offshore of Savannah, Georgia, and Norfolk, Virginia, were assessed by EPA scientists to determine if the monitoring and management of the sites is effective, and to ensure that dredged material disposal is not adversely affecting the sites. In both locations, the OSV *Bold* used side scan sonar to map the seafloor geological features and sediment types within the ODMDS. The seafloor mapping results will serve as a baseline for future monitoring efforts to determine if disposed material is migrating from the disposal site.

In 2009, EPA scientists used the OSV *Bold* to characterize bottom habitat and water conditions at the Tampa ODMDS in the Gulf of Mexico. Viability of Tampa Bay as a commercial marine transportation hub depends upon routine maintenance dredging of all shipping channels. Since options for beneficial use or upland disposal of dredged material are limited in this area, there is a growing need to use more of the Tampa ODMDS. While the Tampa site is quite large and deep, its ability to receive more dredged material is impeded by the existence of a “Briar Patch” habitat. The “Briar Patch” is a disposal mound of dredged material which now serves a habitat for fish populations and sessile (not free-moving) communities. Throughout the survey, scientists also identified and characterized the species that occupy the “Briar Patch” to determine the potential effects of increased dredged material disposal. This ongoing effort in Tampa will supply essential data required for managing disposal within the ODMDS in the most environmentally-protective manner.

EPA scientists also used the OSV *Bold* to collect data from Western Long Island Sound (WLIS), Central Long Island Sound (CLIS), and Cape Cod Bay ODMDS. This data will supplement data collected from Eastern Long Island Sound (ELIS) ODMDS in 2007, as well as support dredged material management efforts, by providing the first complete digital side scan sonar data set for all LIS active disposal sites. This survey was designed to map spatial distri-

bution of the dredged material at the disposal sites, provide information to evaluate the current management of the sites, and to further characterize the sites. Additionally, as a component of this survey, Sediment Profile Imaging (SPI) equipment was used for the first time to characterize chemical, physical, and biological seafloor processes.

Selecting appropriate sites to receive suitable dredged material, as well as subsequent monitoring of designated ODMDS, protects the marine environment. The OSV *Bold* helps to locate and evaluate new areas to receive dredged material. Prior to designating a site for dredged material disposal, EPA scientists are required to ensure that activities at the proposed site do not affect areas of natural, scientific, historical, or cultural significance.

The Mobile ODMDS and the Jacksonville ODMDS both require expansion to support future disposal of dredged materials. Areas for expanding the Mobile ODMDS have been proposed and determined to be suitable locations; locations surrounding the Jacksonville ODMDS are still being examined for potential expansion, or even designation of a new site. Future surveys will continue to identify and characterize suitable areas near the existing Jacksonville ODMDS.

### **EPA's Coastal Eutrophication and Toxicity Assessments**

In 2009, the OSV *Bold* supported four

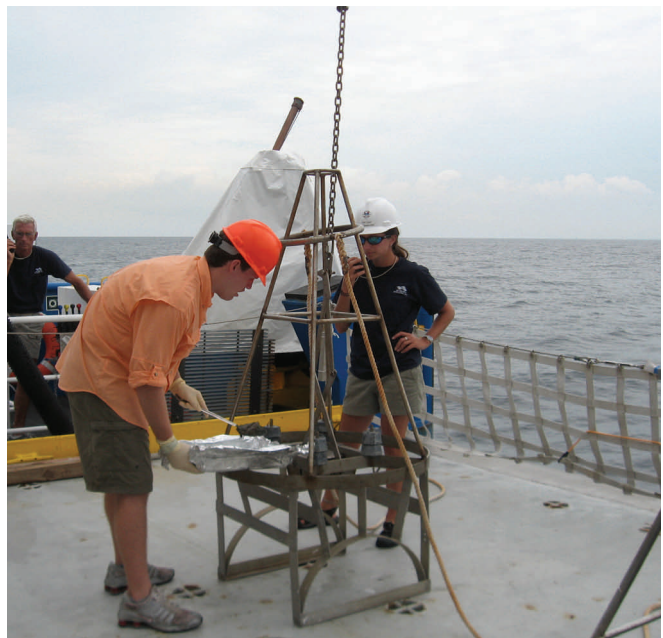


Photo by Morris Flexner, U.S. EPA

**EPA scientist collects sediment samples from the Jacksonville, Florida ODMDS.**

surveys examining eutrophication within coastal waters. Eutrophication is caused by an excess of chemical nutrients such as nitrogen and phosphorus. Significant coastal eutrophication can lead to hypoxia, an environmental condition where dissolved oxygen (DO) is so low that the system no longer supports aquatic organisms. Coastal eutrophication can also lead to alterations in the plankton community, such as the condition known as "red tide" (an increase in toxic, naturally occurring microscopic algae).

Along the Mid-Atlantic Bight, the OSV *Bold* supported an established coastal trend monitoring plan assessing eutrophication. Water quality samples were collected from North Carolina to New Jersey to determine if coastal eutrophication is increasing or declining (long-term nutrient trends), and

what management actions should be considered to improve water quality.

In coastal New England, the OSV *Bold* supported the expansion of coastal nutrient criteria development surveys conducted in 2004 and 2005, by adding additional sampling stations. Over 200 water samples were collected off Massachusetts, New Hampshire, and Maine, with special focus on Penobscot Bay in Maine. There, EPA sampling will complement a major estuarine nutrient criteria study conducted by the Maine Department of Environmental Protection

During August 2009, EPA scientists on the OSV *Bold* conducted a continuous survey throughout Western Long Island Sound (WLIS) to perform DO and nutrient assessments. This survey was the first time continuous sampling occurred in this area. Performing this repeated sampling will provide information on the short-term variability in water column DO and nutrient concentrations, the area and volume of hypoxia over tidal and diel (a daily 24-hour period) cycles, and the vertical mixing of nutrients. It will also assist the National Estuary Program's Long Island Sound Study (LISS) assess future monitoring needs, design programs to estimate hypoxic areas, and improve the models of nutrient mixing in water quality studies of the LIS.

In coastal waters of New York and New Jersey, low levels of DO have been reported as a result of excessive coastal eutrophication. These conditions have led to hypoxic areas, particularly during the sum-

mer months, when high sea surface temperatures create a highly-stratified water column with oxygen-depleted bottom waters. As a result, these hypoxic conditions can result in severe impacts to local benthic populations of fish and invertebrates. In the summer of 2009, the OSV *Bold* monitored coastal waters in the New York Bight from Nantucket, Massachusetts, to Cape May, New Jersey, to provide data on nutrient and DO concentrations, and to assess hypoxic or potential hypoxic conditions. EPA scientists used a water profiler to measure conductivity, temperature, depth, DO, and additional physical properties. The data collected will be used to alert New York-New Jersey Harbor stakeholders of potential or actual low oxygen conditions; to assist in the development of nutrient Total Maximum Daily Loads (TMDLs) (maximum amounts of nutrients that a water body can receive and still safely meet water quality standards); and, to ensure that nutrient conditions are adequately represented in the model used by EPA to describe and predict eutrophication throughout the NY-NJ Harbor.

### **Ocean Outfall Monitoring**

In 2009, the OSV *Bold* supported two surveys on the impacts of ocean outfall discharges on coastal waters.

Along the Mid-Atlantic Bight, EPA scientists collected water samples to investigate water quality near three ocean outfalls in Delaware, Maryland, and Virginia. Levels of

bacterial contamination due to *Enterococci* (bacteria used as an indicator organism to assess human pollution within marine and estuary waters) were assessed. The objective was to monitor the impact of the disposal of pollutants in accordance with the requirements of Section 403(c) of the Clean Water Act.

The second ocean outfall survey was conducted at sewage outfalls in Massachusetts Bay and in southern Maine. The goal of this survey was to determine the influence of river and outfall discharges on nutrient concentrations.

### **Fish Waste Disposal Site Assessment and Monitoring**

The OSV *Bold* supported the annual survey of a fish waste disposal site off the Virginia Capes. The survey evaluated the effect of this disposal on the marine environment, and included collecting data to determine if any recreational fish are in the

area, as well as monitoring the presence of living shellfish species. The survey also examined the site to determine if it was being degraded by the placement of fish waste.

### **Aquatic Invasive Species Impact Assessment**

Aquatic invasive species have affected all coastal waters of the U.S., including the Florida Keys, Caribbean, and the Gulf of Mexico. The most common sources of aquatic invasive species include escapes from aquaculture sources, ballast water discharges, and accidental or deliberate introductions. Invasive species can affect aquatic ecosystems both directly or indirectly; they can reduce native populations and alter run-off dynamics. Consequently, many commercial and recreational activities can be influenced.

In 2009, EPA scientists performed a survey in the Florida Keys National Marine Sanctuary to characterize the existing

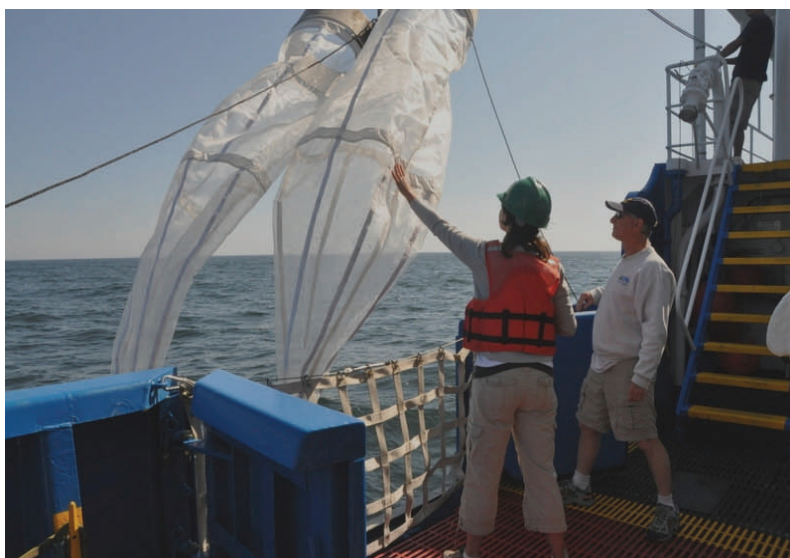


Photo by Jeanette Falvey, U.S. EPA

**EPA scientists deploy bongo nets off the coast of New England.**

populations of *Tubastraea coccinea* (*T. coccinea*), and to assess the impacts of this non-native coral species. *T. coccinea* has the potential to adversely impact native coral reef communities by several factors, including: (1) its ability to kill tissues in native corals; (2) its high reproduction rates; (3) its ability to out-compete native coral species for important resources; and (4) the lack of a natural predator in Florida waters.

EPA scientists collected tissue samples from the non-native coral and also photographed both invasive and native coral colonies. These data will aid scientists in determining the colony/population growth and recruitment rates (the rate at which

free swimming coral larvae settle onto coral reefs) in the non-native species. These data will also help to determine if the presence of *T. coccinea* results in low levels of biodiversity and low recruitment rates in the native coral species.

### **Coral Reef Monitoring and Biocriteria Development**

Coral reefs are declining worldwide due to rising sea water temperature, as well as effects from local stresses, such as excessive nutrient loading, sedimentation, and direct physical damage to coral populations. Coral reefs are extremely important ecosystems because they provide habitat for numerous fish and invertebrate species. The structure and presence of a strong and diverse coral community supports tourism, fisheries, and research opportunities, as well as guarding shorelines from erosion by waves and currents. Corals also provide important sensitivity measures of water quality and general ecological health.

In February and March 2009, a coral condition survey was performed in St. Thomas and St. John, U.S. Virgin Islands (U.S.V.I). The primary objective of this survey was to characterize coral composition, size, and health of corals in the waters surrounding St. John and St. Thomas using EPA's Office of Research and Development's Stony Coral Rapid Bioassessment Protocol. The data collected during this survey, combined with data from two previous surveys of St. Croix, U.S.V.I. corals, will provide a baseline assessment of coral con-

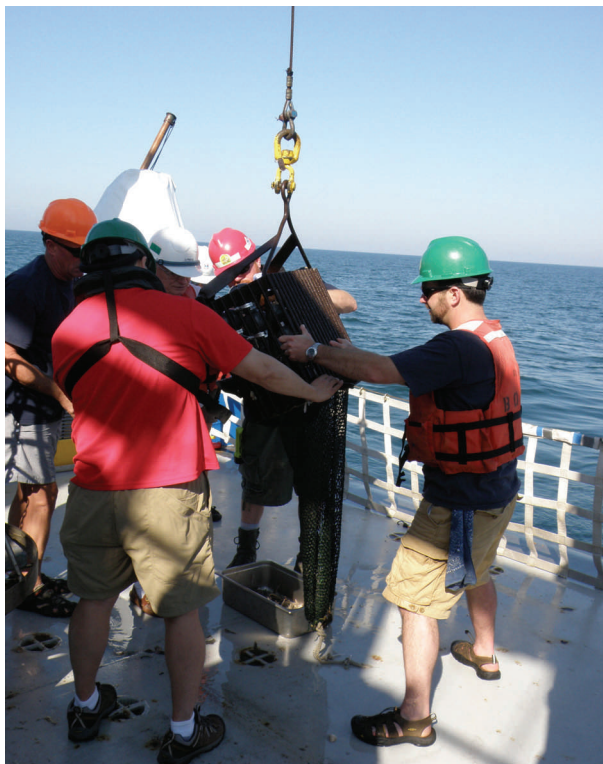


Photo by Renee Searfoss, U.S. EPA

**EPA scientists collect aquatic species data off the coast of Virginia.**



Photo by Charles Lobue, U.S. EPA

**EPA scientists collect coral reef data in the U.S. Virgin Islands.**

ditions in the Virgin Islands, and will help the U.S.V.I. Department of Planning and Natural Resources (DPNR) create an effective long-term monitoring and assessment strategy for the coral reefs in the U.S.V.I.

During the survey in the U.S.V.I., EPA scientists used an innovative protocol designed to capture the complexity of the three-dimensional structure of coral reefs, and identify metrics, or indicators, of coral conditions. Standards based on these metrics can be used to create biological criteria (or biocriteria) with which the DPNR can monitor and manage coastal water quality. Biocriteria are powerful management tools, since biological communities are reliable indicators of aquatic health. The recorded measurements will help scientists to calculate sensitive indices to describe the conditions of the reefs. This survey provided core measurements that can be used to

create the first ever coral biocriteria.

The OSV *Bold* also conducted a survey in the Dry Tortugas National Park (DRTN) in Florida. The survey assessed the ecological status and trends of coral communities throughout the park, as part of the Coral Reef Evaluation and Monitoring Project. The project will also evaluate the effects and recovery from the 2004 and 2005 hurricane seasons on coral communities.

### **Marine Debris Monitoring**

Marine debris (any persistent solid waste material that is directly or indirectly discharged into or abandoned in the aquatic environment) is a problem in oceans, coasts, and watersheds throughout the world. It can result from human activities anywhere within the watershed, such as an overturned trash can on land, litter left on a street or beach, or trash thrown

overboard from a vessel.

To initiate the development of a standardized EPA protocol for marine debris monitoring, EPA and the University of Puerto Rico used various types of gear and sampling methods to survey coastal and open water around Puerto Rico for debris items. All debris collected was counted and categorized, and the various methods of sampling will be evaluated. Additional surveys were also conducted along the Mid-Atlantic Bight to collect marine debris data, which will also be integrated into the development of the protocol.

### **Support to Federal, State, and Academic Partners**

In 2009, the OSV *Bold* supported Federal, State, and academic partners in a number of oceanographic surveys.

Using the OSV *Bold*, EPA scientists partnered with the University of Rhode Island to classify and map fisheries habitats within Rhode Island Sound and Block Island Sound, as well as map areas of historic dredged material disposal. The survey helped to support Rhode Island's Special Area Management Plan studies to determine the best uses of offshore areas, and to facilitate proper environmental management of these areas. Side scan sonar, wide-swath bathymetry (seafloor bottom topography), and sub-bottom seismic equipment were used to map 25 new areas to calculate the distribution of the critical fisheries habitat in both Sounds. The sur-

vey will also determine if there were any long-term impacts of dredged material disposal to habitats in Rhode Island Sound.

In February and March 2009, the OSV *Bold* supported surveys to monitor and assess coastal conditions in EPA's Caribbean jurisdictions – Puerto Rico and U.S. Virgin Islands (U.S.V.I.). Many partners contributed to the success of the 2009 Caribbean Initiative surveys, including the U.S.V.I. Department of Planning and Natural Resources (DPNR), Puerto Rico Department of Natural and Environmental Resources (DNER), University of Puerto Rico (UPR), and the National Oceanic and Atmospheric Administration (NOAA). In Puerto Rico and U.S.V.I., several studies supported various EPA programs, in addition to cooperative efforts with Federal, Commonwealth, and academic partners.

At the beginning of the 2009 Caribbean Initiative, the Puerto Rico government requested the OSV *Bold's* assistance in response to a plane that crashed off Puerto Rico's northwest coast. Performing side scan sonar surveys, the OSV *Bold* was able to locate airplane debris, assisting the government in their search.

EPA, NOAA, and DNER conducted a side scan sonar survey on the OSV *Bold* to provide imaging of benthic outer reef areas south of the Jobos Bay National Estuarine Research Reserve in Puerto Rico. The Jobos Bay National Estuarine Research Reserve encompasses a chain of 15 tear-shaped mangrove islets which create the second largest estuarine area in Puerto Rico. The

benthic mapping from the survey will assist DNER to improve biological monitoring strategies. This project will also provide the data to create GIS maps detailing critical information on the extent and condition of essential recreational fisheries habitat types, and will provide for the development of management strategies to protect and monitor critical fish habitats.

EPA also supported the Caribbean Time Series Station program, which is maintained by UPR, by collecting sea water temperature, salinity, and dissolved oxygen levels, which are all indicators of water quality.

### **Public Education on EPA's Oceans and Coastal Programs**

When in port between scientific surveys, the OSV *Bold* was used for environmental education on challenging issues facing the health of marine waters. In 2009, the OSV *Bold* hosted open ship visits in Georgia, New York, Connecticut, Rhode Island, Maryland, Pennsylvania, Puerto Rico, and the U.S. Virgin Islands. Many of these open ship events were held in urban areas such as New York City, Philadelphia, and Baltimore, helping to increase the public's knowledge of significant water pollution issues which are often greater in urban waters. During the events, scientists and crew members described the OSV *Bold's* scientific facilities, sampling equipment, and dive-operation capabilities to the public.

In Savannah, Georgia, the OSV *Bold* hosted local Girl Scout troops, providing



Photo by Chris McArthur, U.S. EPA

**EPA scientist demonstrates sediment survey equipment to visitors in Savannah, Georgia.**

them with hands-on activities about water quality and the coastal environment. These activities also helped to support Girl Scout badge requirements for Water Wonders, Water Fun, and Science Discovery badges. Additionally, EPA partnered with the Skidway Oceanographic Institute, University of Georgia, U.S. Army Corps of Engineers, Georgia Department of Natural Resources, and NOAA's Grays Reefs National Marine Sanctuary, giving tours and conducting presentations for the public.

In Baltimore, Maryland, the OSV *Bold* hosted an event in which EPA scientists and OSV *Bold* crew demonstrated the state-of-the-art technology and scientific methods used for oceanographic surveys aboard the OSV *Bold*. Attendees included local middle school students; the EPA Assistant Administrator for Water; the EPA Region 3 Acting Administrator; and over 500 members of the public.

# Scientific Surveys in 2010



**EPA scientists pull in a trawl net onboard the OSV *Bold*.**  
Photo by Ashley Greene, U.S. EPA/ORISE

OSV *Bold* surveys scheduled for 2010 include:

- Assessment and monitoring of ocean dredged material disposal sites
- Fish waste disposal site assessment and monitoring
- Ocean outfall monitoring
- Marine debris monitoring
- Coral reef monitoring and biocriteria development
- Gulf of Mexico hypoxia assessment and monitoring
- Coastal eutrophication and toxicity assessments

# Appendix 1: OSV *Bold* Facilities, Equipment, and Capabilities

## Scientific Facilities

Wet Laboratory: Equipped with sieve station (i.e., sieving table and trays); wash station with hot and cold freshwater and saltwater; ice machine (for sample preservation); refrigerator; electronic navigation data ports; and electronic navigation chart display with ship's location and navigation information.

Survey Operations Center: Equipped with refrigerators; freezers; sub-zero freezers; distilled water; computers; storage space; microscopes; and 85 linear feet of lab benches.

Microbiology Laboratory: Equipped with autoclave and incubator.

Data Acquisition Center: Equipped with computer systems to support digital data recorded from side scan sonar operations; water profiler deployment; and underwater video filming.



Photo by Eric Vance, U.S. EPA

**Side scan sonar equipment onboard the OSV *Bold*.**

## Sampling Equipment

Side Scan Sonar: Produces digital acoustic images of ocean floor.

Conductivity, Temperature, and Depth Water Profiler: Measures physical water characteristics *in situ* in real-time throughout the water column.

Rosette Water Sampler: Collects water at specified depths in the water column.

Sediment Sampling Equipment: A variety of grabs and corers are used for the collection of sediments.

Dredges: Collect oceanic organisms from the sea-floor and sediments.

Sampling Nets: Collect oceanic organisms, such as fish and plankton, from various depths in the water column.

A-Frame: Assists the deployment and retrieval of the side scan sonar and sediment sampling equipment.

## Diver Operation Capabilities

Rigid-Hulled Inflatable Boat (RHIB): At all times, the OSV *Bold* carries two RHIBs to support dive operations.

Dive Locker: Nitrox/Air compressor; 31 SCUBA tanks; diver communication devices (i.e., diver-to-diver, diver-to-surface); diver recall system for emergency situations; dry suits; and full-face masks available for use by certified diving personnel.

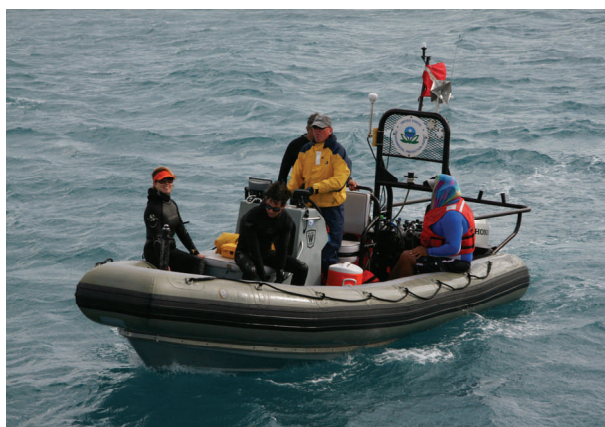


Photo by Charles Lobue, U.S. EPA

**EPA scientists onboard a rigid-hulled inflatable boat in the Caribbean Sea.**

# Appendix 2: Scientific Surveys and Public Education Events in 2009

Survey/Event		Location	Month(s)
Assessment and Monitoring of Ocean Dredged Material Disposal Sites		Savannah, Georgia	April
		Tampa, Florida	May, June, and November
		Jacksonville, Florida	June and October
		Dam Neck, Virginia	July
		Norfolk, Virginia	June and July
		Western Long Island Sound	July
		Central Long Island Sound	July
		Cape Cod Bay	July
		Mobile, Alabama	October
Coastal Eutrophication and Toxicity Assessments		Mid-Atlantic Bight (North Carolina to New Jersey)	July
		New England (Massachusetts, New Hampshire, and Maine)	July and August
		Western Long Island Sound	August
		New York Bight (New Jersey to Massachusetts)	August and September
Ocean Outfall Monitoring		Mid-Atlantic Bight (North Carolina to New Jersey)	July
		New England (Massachusetts, New Hampshire, and Maine)	July and August
Fish Waste Disposal Site Assessment and Monitoring		Southern Virginia	June
Aquatic Invasive Species Impact Assessment	Invasive Coral Species	Florida Keys National Marine Sanctuary, Florida	December

Survey/Event	Location	Month(s)
Coral Reef Monitoring and Biocriteria Development	St. Thomas and St. John, U.S. Virgin Islands	February and March
	Dry Tortugas National Park, Florida	April and May
Marine Debris Monitoring	Puerto Rico	February
	Mid-Atlantic Bight	June and July
Support to Federal, State, and Academic Partners	Rhode Island Sound and Block Island Sound, Rhode Island	August and September
	Quebradillas, Puerto Rico	February
	Jobos Bay National Estuarine Research Reserve, Puerto Rico	February
Public Education on EPA's Oceans and Coastal Programs	San Juan, Puerto Rico	February
	Mayaguez, Puerto Rico	February
	St. Thomas, U.S.V.I.	March
	Savannah, Georgia	April
	Philadelphia, Pennsylvania	July
	New London, Connecticut	August
	Narragansett, Rhode Island	September
	New York, New York	September
	Baltimore, Maryland	September



# **EPA's Ocean Survey Vessel *Bold***

2009 Annual Report

Monitoring and Assessing the Health  
of Our Oceans and Coastal Waters



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